

**"A Complete Guide to Building Explosive Athletic Strength!"**

# ***STRONG*** **AS AN** **OX**



**OLYMPIC WEIGHTLIFTING PROGRAM**

***Olympic Weightlifting  
for Athletic Power!***

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## **Olympic Weightlifting for Sports**

This manual is a guide to assist you in learning the Olympic movements for strength training. The manual should be read through its entirety before beginning a weight training program. Make sure to check with your doctor or physician before starting an exercise program to ensure safety.

**Strong As An Ox: Olympic Weightlifting for Sports**

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## **Chapter 1**

### **Warm- up and Flexibility**

#### **Warm-Up and Cool-Down**

A warm-up of the body prior to exercise is encouraged to prepare the body for the increase in stress that lies ahead. Alter suggests a proper warm-up will improve performance and decrease the chance of injury. In addition, a cool-down gives the body a period of adjustment from exercise to recovery. Warming up can be divided into two basic categories, general and specific.

#### **General Warm-Up**

A general warm-up involves exercising the major muscle groups of the body under light or minimal loading. These movements should be general in nature and not related to movements in the training session itself. Some examples are jogging, riding a stationary bicycle, jumping jacks, skipping or light calisthenics. Alter suggests the warm-up be intense enough to increase the body core temperature and cause perspiration but should not cause fatigue. A thorough warm-up will improve performance through the following mechanisms:

- Increased rate and strength of muscle contraction
- Increased muscle coordination through related movements
- Increased metabolic rate
- Increased efficiency of the neuromuscular system
- Increased work capacity
- Improved cardiovascular and respiratory efficiency, e.g., the adaptation of the heart to exercise stress is improved and likewise oxygen delivery to working muscles is a benefit.
- Reducing the possibility of injury through increased muscle elasticity and improving the joint range of motion. This is particularly important for the development of skill efficiency in Weightlifting.
- Psychological benefits

Following the general warm-up, the athlete or coach may choose to implement a flexibility routine. Flexibility exercises are those exercises that increase the range of motion of a joint. Flexibility exercises succeed the general warm-up because the increase in the tissue temperature will make the stretching both safer and more productive. "Cold muscles" injure easily and stretching them before they are warm can produce stretching and tearing injuries.

### **Specific Warm-Up**

A specific warm-up should always follow the general warm-up and stretching. The specific warm-up relates to activities specific to the weightlifting movements in the training session. Depending on the exercise, athletes may choose to use no weight or choose the bar when performing these exercises. Some examples are:

- Arm circles • Trunk circles • Knee circles
- Wrist circles/prayer/kneeling • Shoulder stretch/dislocates • Squats (front or back)
- Overhead squats
- Squat to overhead press • Muscle snatch
- Pressing movements

### **Cool-Down**

As previously mentioned, a cool-down gives the body a period of adjustment from exercise to recovery. The athlete may choose this time to improve flexibility but more importantly, the cool-down assists in muscular relaxation, promotes the removal of muscular waste products by the blood, reduces muscular soreness and allows the cardiovascular system to adjust to normal levels. Further, this may be an opportune time for the coach to give feedback to the athlete regarding the training session.

### **Strength Training and Flexibility**

There are a number of misconceptions regarding strength training and flexibility. Three examples are strength gains may limit flexibility, flexibility gains may have detrimental effects on strength and muscle hypertrophy will decrease flexibility causing the athlete to be "muscle-bound." On the contrary, strength training or weightlifting does not limit

flexibility but actually improves it through proper coaching and technical mastery. Alter feels there are two key principles for developing flexibility through resistance training.

First, the muscle or muscle group must work through the entire range of motion.

Second, there must be an emphasis on the eccentric contraction. Because there are fewer muscle fibers involved and the tension on them increases, there is greater stress on the muscle fibers while still trying to work through the full range of motion.

Consequently, this increases flexibility. However, coaches and athletes alike should be aware since there is greater stress on the muscle fiber, there will also be greater stress on the connective tissues. In addition, athletes will find eccentric training will produce greater muscle soreness.

### **Helpful Knowledge for Stretching**

Weightlifting is a sport that requires a tremendous amount of flexibility. Lack of flexibility in major muscles or joints, such as the shoulders, elbows, wrist, hips and lower leg may limit potential. Therefore, the coach should acquire basic knowledge in this area.

Further, the coach should be familiar and consistent with stretching methods and understand the structure and function of the muscles and involved joints.

In weightlifting training, increases in strength are due to the organism adapting, over time, to the added stress. Flexibility training works in the same manner. Consistency and exceeding the existing range of motion are responsible for increases in flexibility. The body's adaptive response is to increase flexibility in the active joints.

### **Joint Flexibility and Limitations**

According to Alter, five factors limit joint flexibility. They are:

1. Lack of elasticity of connective tissues
2. Muscle tension
3. Lack of coordination and strength in muscles or joints during active movement
4. Bone and joint structure limitations
5. Pain

In addition, to increase range of motion at a joint, stretching must accomplish one of three things: 1) increase the extensibility of connective tissue 2) increase inter-muscular coordination and 3) increase intra-muscular coordination.

## **Types and Varieties of Stretching**

Although there are numerous recognized forms of stretching, this chapter will concern itself with only three: Static, Ballistic and Passive/Active. Whichever method is used, the possibility of injury depends on several factors including intensity, duration, frequency and velocity.

### **Static**

Static stretching is an effective and popular technique, which involves holding a position for a period of time, typically between ten and thirty seconds, which the individual may or may not repeat. Static stretching involves maximal control, little or no movement and minimal to zero velocity of movement. Advantages of static stretching include scientific research supporting increases in range of motion, nominal space and equipment and minimal to no muscle soreness. Further, all populations can benefit from static stretching with little to no restrictions.

### **Ballistic**

Ballistic stretching involves movement in a dynamic fashion. Many athletes such as gymnasts and martial artists use ballistic stretches as a warm-up where movement through a full range of motion is necessary. In addition, numerous weightlifting athletes incorporate ballistic stretches to prepare the tendons, ligaments and the musculature around the major joints for external load bearing exercises. These sport-specific stretches and movements are effective in improving flexibility and mobility. Examples include leg swings or kicks, dynamic arm circles or extensions, shoulder dislocates and any type of stretch that includes bouncing, bobbing or rhythmic motion. The athlete should stop or rest when the amplitude of the movements decrease due to fatigue.

However, coaches and athletes should be aware; there are disadvantages to ballistic stretching. These include:

1. Inadequate tissue adaptation- If tissue is stretched too rapidly, lasting flexibility cannot be optimally developed.

2. Soreness resulting from injury- If the ballistic movements are high in amplitude, slight tearing or stretching injuries may occur in the musculature.

3. Initiation of the stretch reflex- If a sudden stretch is applied to the muscle, a reflex action is initiated causing the muscle to contract. This causes an increase in muscle tension and a decrease in stretching ability.

## **Passive/Active Stretching Techniques**

### **Passive Stretching**

The individual who is stretching does not contribute to the stretch. Rather, a partner does all of the manipulation. This may benefit both athletes in a number of ways:

1. Compliance
2. Positive feedback from the partner
3. Familiarization with anatomy and physiology through a comprehensive stretching program
4. Reduces boredom

### **Passive-Active Stretching**

The partner assists in the initial stretch and then individual attempts to hold the position isometrically for several seconds.

### **Active-Assisted Stretching**

Initially, the individual actively stretches the muscle. When the individual reaches the muscle's limit, the partner then completes the range of motion for the stretch.

### **Active Stretching**

The individual completes the entire stretching routine with no assistance. Active stretching can be either static or ballistic. Both of these stretching techniques are appropriate for the majority of athletes. Please refer to the previous section for the description of static and ballistic stretching.



## **Chapter 2**

### **Competition Lifts/Weightlifting Technique**

#### **Starting Position**

The starting position, for a weightlifter, is of primary importance. An athlete cannot finish "right" if they start "wrong".

1. All body levers are 'tight'.
2. The feet should be in the athlete's 'vertical jump' position with the toes turned slightly out. The shins should be touching the barbell.
3. The back should be 'flat' and even have a slight, concave, curve to it.
4. The arms should be straight and the elbows 'locked' and rotated outwards.
5. The head is up with the eyes focused straight ahead.
6. The hips are higher than the knees.
7. The shoulders are in advance of the bar.

The coach should stand in a position that gives him, or her, a 3/4 angle to the athlete. This view allows the coach to watch all aspects of the lift.

The Area of Base of the lifter is the position of the feet for the pull. The barbell trajectory is the path the barbell takes during the pull. A 90-degree angle gives the coach the best position for viewing barbell trajectory.

Stability of the lift will keep the barbell within the proper trajectory and over the base of the lifter (the feet) during the execution of the pull. If the athlete allows the barbell to move outside of the COG, during the pull, success is unlikely.

#### **The "Pull"**

Pulling the barbell from the floor, in either the snatch or the clean, has become an exact science. The barbell's inertia is the first thing the lifter must overcome and to do this, efficiently, the coach must be conscious of the force sources available and the order in which they are used.

1. The barbell must move 'back' towards the athlete, immediately.
2. The hips and shoulders should rise at the same rate.
3. The head stays in a level position.
4. The "2<sup>nd</sup>" must be faster than the "1<sup>st</sup>" Pull.
5. The athlete tries to stay 'flatfooted' as long as possible
6. The arms only bend to pull the athlete under the barbell.
7. The feet move from the 'pulling' position to the 'receiving' position.

## **Weightlifting Technique**

Weightlifting coaches throughout the world face the same problems in coaching their athletes to lift the greatest possible weight. The barbell has inertia, e.g., it wants to stay on the platform. Once raised from the platform it is subject still to the force of gravity and in movement to Newton's Laws of Motion. These are standard and constant variables.

To overcome the forces, which are trying to keep the barbell on the platform, or to return it there is the mechanism by which the barbell is raising, e.g., the lifter. The lifter is of standard dimension, slight variation in physique is apparent as is size but as a basic lifting machine, lifters are the same. The human physique is made up of a complicated system of levers (the bones and joints) and power sources (muscles), which are serviced, by a complex communication system (nervous system) and an efficient energy transportation system (blood circulation, etc.). This may be an oversimplification, but it serves to identify the areas of importance. The lifter then exhibits a whole series of variables, to lift the weight in the most efficient way, e.g., maximum weight lifter for the lifters capabilities.

The system of levers, the bones and joints, do not vary in length or position in individual's body, etc., but the way and order in which the athlete uses these levers (lifting technique) can vary. Making the muscles stronger and faster contracting can vary the power sources for the levers, the muscles. The communication process, nervous system, can be improved in efficiency by movement pathway reinforcement and stimulation through the brain (focusing and motivation). The energy transportation system and source can be made more efficient through diet and training in various ways.

The first variable, lifting technique, is of massive importance, especially to beginning or young lifters. Movement patterns learned initially tend to last the longest, so it is good sense to learn the most efficient techniques from the start. Correct technique is

important so that the lifter can most efficiently utilize the power one has available to overcome the greatest possible weight.

In lifting weight in any facet, the lifter must be constantly aware of the center of gravity. It is no good being able to exert enormous force on the bar if the lifter is eventually going to fall over or totally lose control of the barbell. The size of the base and the line of action, which is always vertically down of the center of gravity of barbell and lifter (which is considered a unit once the barbell is raised from the platform) govern balance.

The lifters' feet provide the base for weightlifting and therefore firm, stable lifting shoes are necessary. The pictures below show that stability is maintained and thus balance preserved when the line of action of the combined center of gravity of lifter and barbell falls within this base. Good balance allows the lifter to control the barbell, poor balance allows the barbell to control the lifter.

Initially, as lifters approach the barbell to "get set" to pull it up, the lifter ensures the feet are placed correctly to guarantee a stable lifting position. The normal foot position is approximately hip width apart. Some individual variation will be seen to cater for comfort and individual difference in hip, knee and ankle structure but the variation is slight.

The feet, too, turn out for comfort, but this is by no means a prerequisite. The athlete grasps the barbell with a hook grip to make certain total unity of hand and barbell, and for other technical reason to do with premature elbow bending, etc. With the erector spinae muscles of the back fully contracted, to set the bones of the spine into a long lever, the chest is inflated and raised to form a pneumatic brace against any tendency of the back to round forward, the hips are lowered until the angle between lower and upper legs is between 80 and 100 degrees. This angle has been demonstrated through research as the most efficient for maximum force generation of the legs and hips. The shoulders in this "get set" position are in front of the bar, and the arms are straight with the elbows rotated out.

The barbell's inertia is the first thing the lifter must overcome, and to do this efficiently the coach and lifter must be conscious of the force sources available, and the order in which they should be used. In the same way as the space rocket engineer designs his rockets to have the largest forces available to lift the rocket initially from the ground and out of the earth's atmosphere, so the lifting coach must ensure that the lifter is using the strongest muscle groups to break the inertia of the barbell. The strongest muscle groups in the human body are the legs and hips and these muscles lift the barbell from the platform. They are the "first stage" rockets. In addition, the angle of the back throughout this initial phase of the pull should remain constant as the legs straighten, and should show no change until the bar has reached approximately the height of the lifter's knees.

For all lifters in this initial phase of the pull, the barbell moves back toward the lifter. The barbell is not swung back but eased back. The extensors of the legs initially lift the barbell from the platform. Concurrently, the knees move back allowing the bar to stay

over the center of the foot (area of base). This allows the lifter a more stable, balanced position in which to exert force.

Once the inertia of the barbell is broken and the barbell begins to come off the platform, the lifter must endeavor to accelerate the barbell's ascent throughout the range of the pull. This acceleration is necessary to impart momentum to the barbell so that at the conclusion of the pull, the barbell will continue upward in its path long enough, before gravity eventually wins, to allow the lifter sufficient time to descend under it to receive the bar in either snatch or clean.

As the barbell arrives at approximately knee height, the muscles that extend the legs complete their work, and the powerful muscles, which extend the hip, take over. It is a point of muscle work transference. Now a fortunate anatomical accident occurs which if handled correctly, works very favorably for the lifter. Some of the major muscle groups, which extend the hip, the hamstrings, are muscles that cross two joints, e.g., the hips and the knee. As the hamstrings begin to contract strongly and violently, and as long as the lifter keeps the arms perfectly straight allowing the bar to scrape along the thighs, the contraction causes not only extension of the hips, but also flexion of the knee. Coaches sometimes refer to this as the "Double Knee Bend." The coach does not actually teach this, it occurs naturally. However, because of this "anatomical accident" the lifter is now able to utilize the body's major power source, the legs, a second time in the final part of the pull.

As the hip extension continues and the barbell reaches roughly the height of the upper thigh the lifter is now ready for the final part of the pull. This final pull requires maximum effort and coaches refer to it as the "explosion phase" or the "second" pull.

With the legs partially bent, due to the reasons given, and the hips almost finishing their extension, the lifter begins to extend the legs and hips vertically upward in almost a jumping action while simultaneously violently shrugging the shoulder and rising on to the balls of the feet, as the chest is kept inflated throughout. At no time during the pull are the arms bent. The power of the arms is relatively weak, and they remain straight until the next phase of the pull when the lifer accelerates under the bar.

The lifter, at all times tries to pull the bar straight up. The base of the lifter changes during the final extension (explosion) phase as the lifter plantar flexes in preparation for descent under the barbell.

When the final (explosion) phase is complete, the lifter breaks contact with the platform and jumps the feet out laterally into the receiving position while actively pulling on the bar with the arms. This pulling action does not pull the bar up; it pulls the lifter down, and accelerates the descent. If the lifter has imparted sufficient momentum to the barbell it will continue to rise during this phase until gravity overcomes the momentum and the barbell itself begins to descend.

The position of the arms during the pull is also important. Once the athlete grasps the bar in the "get set" position, the elbows rotate out to the sides and stay in this position throughout the pull. This aids in keeping the path of the bar as close to vertical as possible and makes it more difficult for the bar to swing forward as the combined center to gravity moves to the ball of the feet during the final phase. Rotation of the elbows also assists in keeping the arms straight during the entire pull.

## **Receiving Positions**

### **Snatch**

The lifter has, in executing his explosion phase, to keep in contact with platform throughout and for as long as possible. However, once this phase has been complete, the bar has a certain amount of momentum, and this momentum allows the bar to rise until gravity wins the race and it stops, and begins to accelerate downward. The time span involved is very small and the lifter must get down and under the bar to receive it as quickly as possible. From the extension position at the end of the explosion phase, the feet move out into the squatting position. The foot position recommended for pulling is hip width apart, which is not an optimal position for squatting and receiving the bar. The lifter's feet must be wide enough for a comfortable squat and the toes turn slightly out, which brings the hips forward into the final position over the feet.

As the feet are moving, the arms pull violently on the bar. The feet are no longer in contact with the platform so this action accelerates the lifter's descent down and under the bar. The elbows are wide and this keeps the body in as upright a position as possible. As the feet land the wrists turn over and the bar rotates. The lifter does not just drop under the bar and catch it - he pulls himself down, under, and as his wrists turn over as he is coming in to land so to speak, he punches up hard against the bar. This last action does not push the bar up but further accelerates the descent into a stable squat position. It is important that, to facilitate this, the chest be inflated.

Therefore, throughout the descent under the bar the lifter continues to exercise force on the bar. In the full squat receiving position, the lifter still tries to push up against the bar at all times to help control the bar. The knees are forward over the feet to facilitate the upright trunk and to bring the hips between the feet. Recovering from the squat, with the weights being handled nowadays is by no means the easy procedure it once was and we continually see lifters, even in important competitions, losing lifts in the recovery stage. To facilitate a controlled recovery, the lifter eases the weight back, pushes his head forward and in doing so raises his hips. This opens the angle between the upper and lower legs and initiates the extension of the leg. From then on, he keeps pushing hard with the legs while keeping upward pressure on the bar until he stands upright. Care must be taken not to push the head in too far as this can cause a stretch reflex in the muscles of the chest and shoulders, causing the bar to come forward again and the

lifter loses balance forward. This often results in the lifter having to step or run forward to save or otherwise miss the lift.

## **Clean**

Moving into the receiving position for the clean has many similarities with the snatch though obviously the grip width is less and the bar, being much heavier, does not have as much momentum and does not achieve the same height. However, since the lifter will receive the bar at the shoulder, it is not required to travel as high.

From the extension position, the feet jump out as in the snatch and the arms pull the lifter down and under the bar. As the feet land the wrists rotate around the bar and the elbows push forward and upward under the bar. As the lifter moves into the squat the bar is received on the chest and shoulders and the weight of the bar will drive the lifter down into the deep squat -- as this is happening the lifter must push the elbows up high to fix the bar and avoid any chance of the bar "bouncing out." The knees are forward over the feet and the chest is kept high to facilitate an upright trunk position.

The lifter recovers by raising the hips to open the angle between the lower and upper legs and pushing the elbows forward to ensure the bar does not slip down the chest.

## **The Jerk**

In discussing and describing the snatch and clean receiving position, reference only to the squat technique has been discussed. This is because the split technique is far less efficient than the squat. There are many balance and weight transference problems inherent in the split, which also compound other problems such as force production and receiving position height. Today, at the world level, athletes exclusively use the squat technique. It will continue to rise during this phase until gravity overcomes the momentum and the barbell itself begins to descend.

The position of the arms during the pull is also important. Once the athlete grasps the bar in the "get set" position, the elbows rotate out to the sides and stay in this position throughout the pull. This aids in keeping the path of the bar as close to vertical as possible and makes it more difficult for the bar to swing forward as the combined center of gravity moves to the ball of the feet during the final phase. Rotation of the elbows also assists in keeping the arms straight during the entire pull.

Once the lifter has recovered from the clean, the athlete will place the feet back into line until they are approximately hip width apart. This foot position is the most efficient for exerting upward force through the body to the bar. The bar should rest on the shoulder and upper chest. It is essential that the lifter get set for the jerk, as many jerks are lost

because of a rushed preparation. The lifter should take in a deep breath and hold it until the jerk is completed. This technique is vital to keep the chest elevated and to provide a solid "platform" to perform the jerk. This also helps to keep the body vertical throughout the jerk.

The arm position prior to jerking is also noteworthy to mention. The athlete should not grip the bar tightly; in fact, a slack grip is adopted. This is crucial otherwise, the arms and shoulders tense up and the lifter will tend to push the bar away from the shoulders. This will cause the lifter to lose the jerk in front. The elbows should be in a comfortable position. The dip for the jerk is the most important phase of the lift.

It is the phase when the lifter is exerting maximum force on the bar before moving into the receiving position of the split. Force production in the jerk is comparable to the pull phase in the snatch and clean.

Keeping the body vertical, the lifter bends the knees by pushing them forward. Weight distribution should be on the heels. The dip must be short, vertical and explosive. Vertical ankle, knee and hip extension is crucial so force exertion is vertical on the bar. The lifter should drive onto the balls of the feet before splitting them fore and aft simultaneously.

As the lifter catches the bar in the receiving position, the arms push up against the barbell. The lifter should receive the bar above the ears and the barbell should be in a vertical line with the shoulders and hips. This also ensures the barbell is within the lifter's area of base. The front leg is perpendicular to the platform, the rear leg is bent at the knee, and the weight is on the ball of the foot. Once in a balanced split position, the lifter must continue pushing up hard against the bar and keep the chest elevated.

The recovery from the split should be controlled and unhurried. The bar should be eased back slightly moving weight on to the rear foot. This enables the lifter to step his leading foot back into the original starting position and bring the rear foot forward into line.

## **Chapter 3**

### **Basic Weightlifting Exercises**

When introducing young people to weight training, it is important to have them working in a success-orientated environment. By initially teaching exercises with a relatively low skill element, one can initially get familiarity with the barbell, establish safe training practices and strengthen the muscles of the body in ranges of movement required for efficient weightlifting. In addition, learning multiple joint movements, the beginner athlete will increase the efficiency of the neuromuscular system while a variety of exercises will keep boredom to a minimum. Also, not to be forgotten is that people attracted to weightlifting and making the initial decision to try the sport want to actually lift weights as quickly as possible.

For most beginners, starting all the basic exercises with just the empty bar is a good principle, while the athlete learns the movement pattern in good balance. For some even this resistance might be too much and a lighter exercise bar or even a broomstick is enough. The coach must make this judgment and by so doing will ensure initial and future success. The gradual, progressive increase of resistance develops as "feeling" for the movement develops.

The first exercise that is learned is the front squat. Many athletes who begin the sport of Weightlifting are unable to "rack" the bar properly. Please refer to Figure 2 to see the proper "rack" position. The cause of this may be lack of flexibility, lack of coordination, a previous injury or other issues. It is vital the athlete learn to "rack" the bar properly and be able to squat through a full range of motion with good technique before attempting any ballistic or dynamic movements with external resistance.

#### **Front Squat**

This exercise is not only an excellent developer of the muscles, which extend the knee and hip, but the front squat also develops strength and balance in what will become the receiving position for the power clean. Before proceeding with learning the front squat, the coach should test the lifter's ability to perform a full squat with an upright trunk while keeping their feet constantly in contact with the platform. To do this test, the lifter should place her feet slightly wider than hip width, turn the toes slightly out, set the trunk in an upright position and by bending the knees and by pushing the knees out and forward over the toes, move down into a full squat position. If, however, the lifter initially finds she can only move into the squat by raising the heels, then the lifter is not ready and adjustments may be suitable. Lifters may do bodyweight squats or use an empty bar to practice the movement until mobility and flexibility allow the lifter to perform the front



squat correctly. Eventually, over time, mobility and flexibility will improve for the lifter to perform the movement correctly.

Before actually beginning the movement proper, the lifter should warm up the squat position- with or without resistance- by doing a few squatting repetitions. This will bring blood to the area, elevate the heart rate and warm the muscles up for the exercise thereby reducing the chance for injury.

## **Starting Position**

In the front squat, the lifter takes the barbell from the racks, the lifter grips the barbell evenly, slightly wider than shoulder width. By pushing the elbows up and inward, the shoulders and chest form a "rack" on which the barbell can rest. The lifter steps forward with one foot under the barbell with a "fore and aft" foot stance. The lifter extends the legs and lifts the barbell from the racks. This is the starting position.

## **Performing the Front Squat**

The lifter has taken the bar from the rack and assumed the starting position. It may be wise when initially teaching this movement to have spotters standing on either side of the barbell to ensure safety. However, one of the advantages of learning the front squat before the back squat is that in case of problems the lifter can very easily drop the barbell from the shoulders back to the platform with no injury risk. The lifter has placed their feet wider than hip width and turned the toes out slightly. The barbell is resting on the shoulders and upper chest with the elbows pushed up to ensure a stable position. The lifter takes a deep breath and holds it while keeping the chest elevated throughout the whole movement. Then, by bending the legs, the lifter moves into a full squat position.

The lifter pushes the knees forward while the trunk remains upright. From this low position, the lifter straightens the legs and returns to the starting position. Once there, she exhales and then re-sets for further repetitions. Once the set is complete, the lifter places the barbell back onto the racks. The reason the lifter backs out from the rack initially is so when the set is completed and fatigue has set in, the lifter can walk forward, which is much easier and safer, to replace the barbell.

## **Power Clean**

This exercise is fundamental to weight training as it initiates the development of "pulling" the barbell correctly. Introduction in progressive stages and the core exercise is initially broken down into easily taught parts moving from the top down.

### **Part 1.**

#### **Power Clean from Mid-Thigh:**

The lifter approaches the barbell placing the feet underneath the barbell at approximately hip width apart. Most people find that if the toes are slightly turned out, this gives a more comfortable and balanced position.

The lifter grasps the barbell with a shoulder width grip, evenly spaced and stands in the "starting position". Here the lifter inflates the chest and "sets" the back. This "back setting" is crucial to successful lifting and the coach must teach it correctly to the lifter from the start. The lifter slightly unlocks the knees and then moving from the hips only, lowers the barbell until it touches the middle of the thigh.

The lifter then extends the body upward in a violent motion. All the time, shrugging the shoulders and keeping the arms straight and rising up on the balls of the feet.

The lifter should have a very vertical position. The head is in alignment with the rest of the body and the eyes are focusing straight ahead. In addition, the trajectory of the barbell is vertical and remains very close to the body.

When the second pull phase is complete, the lifter pulls herself swiftly under the bar by bending the legs and rotating the elbows up and under the bar, fixing the bar on the shoulder and upper chest. This is the receiving position.

The barbell is within the area of base and the center of gravity (COG) is over the heels. This represents a very solid receiving position. The lifter then stands upright, breathes, sets the barbell to the starting position and repeats the whole process for the required amount of repetitions.

#### **Power Clean from Knee Height:**

Once the lifter can perform the clean from mid-thigh successfully, the coach can progress to the next stage. From the starting position, the lifter now lowers the bar to knee height while still moving from the hips and keeping the chest inflated and the back setting is tight, the shoulders move forward over the bar. In addition, it is imperative the

lifter stay flatfooted as she lowers the bar to this position. From this position, the lifter extends the body as before and power cleans the barbell into the receiving position. The coach should encourage the athlete to allow the bar to scrape the thighs. Once the coach decides the movement is efficient, the lifter can be progressed to the next stage.

### **Part 3.**

#### **Power Clean from Below the Knee:**

In this progression, the lifter lowers the barbell steadily to the position. The knees must bend slightly more to get into the position as shown. Once again, from here the hip and knee extensors pull the barbell into the receiving position by extending the body upward and allowing the bar to scrape the thighs. The majority of athletes spend more time training on this stage before moving on to the final progression.

### **Part 4.**

#### **Power Clean:**

The lifter approaches the barbell while it is on the platform and adopts the starting position. The lifter again sets the back and rotates the elbows out to the sides while the arms remain straight and the shoulders are in advance of the bar. The lifter should ensure a balanced position with the feet flat on the platform and his bodyweight distributed over them. From this position by pushing with the legs and extending them, the barbell moves upward increasing in acceleration and finishing in a violent shrugging movement while rising up on to the balls of the feet and finishing in the receiving position.

### **Back squat**

The back squat, or squat, is one of the key exercises in weight training for developing great strength in the legs and hips. It is not as "lift specific" as the front squat but is none-the-less, a basic strength exercise. Teaching the front squat before the back squat is not mandatory however, once the coach teaches the front squat, the back squat becomes very easy to learn. In addition, the back squat uses more weight compared to the front squat.

Once again, the lifter takes the barbell from the squat rack and positions it upon the trapezius and upper shoulders. The grip width may vary in the back squat with different individuals but a grip width outside the shoulders is normal. Similar to the front squat,

spotters are available on either side of the bar for safety reasons. It is important at this point to draw the shoulders back causing the musculature of the shoulders to contract. The musculature and not the vertebrae then support the barbell. The lifter then steps back from the racks to the starting position. Again, the lifter's feet are wider than his hips and the toes turn out slightly. The lifter takes a deep breath to inflate the chest to further "set" the body position. Then, holding this position and keeping the trunk upright, begins to descend in to a full squat position shown in Figure 18. From this position, the lifter stands up until he is back in the starting position. In addition, as the lifter is standing up from the squat position he should be exhaling.

## **Power Snatch**

This lift approximates very closely to the competition lift, the snatch, and in fact fulfills all the rule conditions for the competitive lift. The basis of performance is pulling a barbell from the platform to arms' length, above one's head in one continuous motion. However, in the snatch, the lifter will receive the weight at arms' length while sitting deep in the squat position, while in the power snatch the squat is not included. Like the power clean, teaching the power snatch in progressive stages is appropriate so that beginners always find themselves in a success oriented learning pattern.

### **Part 1.**

#### **Power Snatch from Mid-Thigh:**

The lifter places her feet hip width apart, turns the toes out slightly and grasps the barbell with the snatch grip discussed earlier. The lifter stands erect while holding the barbell with straight arms and the bar touches the upper thigh or lower abdomen. The lifter then, rotates the elbows out and with a slight bend in the knees and moving from the hips lowers the barbell to the mid- thigh.

From this mid-thigh position, the lifter will extend his body upwards in a violent movement, extending the hips, shrugging the shoulders and rising up on the balls of his feet. The lifter will exert so much force onto the barbell that it continues to rise up as the lifter pulls himself under the barbell.

## **Part 2.**

### **Power Snatch from Knee Height:**

Once the lifter is handling the power snatch from mid-thigh efficiently, the coach introduces the next progression. Adopting the same starting position as the power clean, only with a wider grip, the lifter lowers the barbell to knee height. Once again, the lifter is moving from the hips and the shoulders will move forward and over the bar while staying flatfooted. From this lower position, the lifter snatches the bar to arms' length and catches it in the same receiving position as before. This allows the bar to scrape along the upper thigh or lower abdomen.

After jumping under the bar, the lifter will receive the bar at arms' length above the head. From this receiving position, the lifter stands erect and then lowers the bar to the mid-thigh position in preparation for the next repetition.

## **Part 3.**

### **Power Snatch From Below the Knee:**

The next progression is to lower the barbell to a position, which is below the knee but not actually touching the platform. In addition to moving from the hips and bringing the shoulders forward over the bar, the lifter also has to bend the knees a little more. The lifter then pulls the barbell straight up, allowing it to touch the high thigh or lower abdomen and catches the weight in the receiving position after an explosive jump. The athlete should perfect this movement before moving on to the next progression.

## **Part 4.**

### **Power Snatch:**

This is the power snatch proper and entails lifting the barbell from the platform directly to the receiving position. The lifter has his feet hip width apart under the barbell. The lifter grips the barbell evenly with the snatch grip. The back is set flat and the lungs are inflated. The arms are straight while the elbows rotate out to the sides and the shoulders are in advance of the bar. From this position, the legs and hips pull the barbell from the platform. As the barbell passes the knee, it accelerates the whole time, until touching the upper thigh or lower abdomen. The barbell is then "caught" in the receiving position overhead. When performed correctly the power snatch is an excellent exercise to build strength and power.

## **Determining the grip width for the Snatch**

Learning the snatch and using the relevant exercises to develop the skill and strength to perform the snatch properly, the following may be useful. All lifters use a wide grip in the snatch to perform the movement as efficiently as possible. The wider the grip the less distance the lifter has to pull the barbell from the platform to the receiving position above the head. However, grip width is individual and may depend on the following factors:

- Dimension of the barbell
- The bar must clear the lifter's head
- Wrist discomfort when holding the bar overhead
- Upper body strength when holding the barbell overhead
- General comfort and balance in the low receiving position
- Grip strength
- Arm length

The following methods to assess grip width for the snatch has given good results

As a guide to the width of grip to use, the lifter holds her upper arms horizontal, and the coach measures the distance from elbow to elbow across the athlete's back. This distance is then marked on the barbell. The lifter should grasp the barbell so these marks lie between the first and second fingers. The lifter from the start position, may also squat down while keeping the arm angle constant until the hands touch the barbell. This then, would be the snatch grip. This method is not as accurate but will be appropriate for novice lifters. A good indicator for proper grip width for the coach is as the athlete holds the barbell overhead, the distance should measure approximately four to six inches from the top of the head to the bar. Keeping in mind, adjustments for comfort and individual difference are appropriate. Please refer to the video for other techniques for the snatch grip.

## **Chapter 4**

### **Skill Transfer Exercises**

Once lifters have learned and practiced the Basic Weightlifting Exercises for a period decided by the coach, and this time will depend on an individual's abilities, skill transfer exercises can be introduced which will assist the lifter in learning the competitive lifts in a success-orientated environment. It is important not to move lifters to the next progression or exercise until they are ready and able to succeed in the new movement. Nothing destroys lifters' enjoyment and self-esteem more than failure, so coaches must attempt to ensure success. Success not only breeds success, it also enhances satisfaction and encourages commitment to carry on to the next progression and stay with the sport. For all these exercises it is probably best if the beginner start with just the empty bar (15 and 20k), a lighter bar or even a broomstick if the bar is too heavy and gradually increase the weight as the skill develops.

#### **Skill Transfer Exercises For Learning the Snatch.**

##### **1. Overhead Squat**

The lifter takes a barbell from the squat rack with a snatch width grip. The barbell rests on the shoulders and upper back as with press behind neck-snatch grip. The lifter spaces the feet apart as for the performance of the Front Squat. The athlete presses the barbell from behind the neck to locked arms. This is the starting position. The lifter takes a deep breath and holds it throughout the movement. The back is set and the lifter slowly moves into a full squat position. The lifter then stands upright into the starting position and breathes out before setting for a further repetition.

It is important to move steadily in this important exercise. Controlling the barbell and "feeling" the movement develops confidence in the low receiving position. Once mastered, the weight increases should be gradual. Whenever doing this exercise, it is always good policy to have spotters available, as balance is a key ingredient in successful performance. Once lifters are handling the Overhead Squat with confidence, they may move on to the next progression.

## **Chapter 5**

### **Program Design**

*Training can produce three things.*

*No progress, Improvement or Collapse*

A primary concern of coaches is improvement. However, unless coaches understand and properly incorporate the principles of resistance training, failure can easily result.

### **Progressive Overload**

The body will accommodate and adapt to stress or overload. This corresponding amount of work for the individual will depend on many things such as age, experience, current strength and endurance levels, etc. The experienced coach will learn to make assessments quickly.

However, for the beginning coach the watchword is to initiate work at a low level and increase steadily over time until an acceptable level of stress develops.

Once the body has adapted to the initial stress, the amount of work increases by a small amount until adaptation to this develops. In weightlifting training, the stress or overload varies as the barbell weight changes. Gradually and progressively increasing the weights lifted will produce rapid improvement. However, within time, this system gradually begins to suffer from the law of diminishing returns. At this point, the use of more sophisticated methods of producing the stress/overload is apparent.

### **Repetitions and Sets**

In Weightlifting and weight training, lifting a given weight a number of times in succession produces fatigue in the muscles involved and a commensurate level of stress develops. Successive lifts are repetitions, e.g., a lifter might snatch 100 Kg for three repetitions. This means the lifter does the lifts with none or minimal rest between. After performing a group of repetitions, the lifter takes a rest to allow the body to recover and then performs another group of repetitions. These groups of repetitions are sets. An overload to the system can best be produced in weightlifting training by doing several sets of repetitions of a given lift or exercise.



Once again, the progressive increase of the weight lifted will produce the ability to increase force production and lift heavier weights. On the high skill exercises and lifts, three repetitions per set is advised for four to five sets with increasing resistance. For the strength and power building exercises, three to four sets of five repetitions are advised.

In Weightlifting training, "shorthand" is often used to list or record the training performance, e.g., Power Clean (60x3) (70x3) (80x2) 3

This means the lifter will, after the warm-up, perform 60 kg for three repetitions, 70 kg for three repetitions and 80 kg for two repetitions for three sets.

\*Note: Percentages may be substituted for kilograms.

## **Muscular Factors Relating to Strength and Power**

### **Hypertrophy**

Muscle hypertrophy, or an increase in the cross-sectional diameter of the individual muscle fiber, represents the -mechanical basis for increased strength. Simply put, a thicker fiber can create more tension than a thinner fiber. With resistance training, there is an increase in muscle fiber cross section if the load is sufficient. An increase in maximal strength typically accompanies this. There is evidence in studies by Hakkinen that the use of explosive power training movements promotes hypertrophy primarily in the Type II or fast twitch fibers.

### **Fiber Type**

Human muscle consists of a mixture of slow-twitch fibers and fast twitch fibers. The slow—twitch (ST) or Type I fibers are best suited for low force, longer duration situations such as postural control and endurance activities. The fast twitch (FT) or Type II fibers contract much faster and generate greater peak force. Fast twitch fibers subdivide into a fatigue resistant type and a fatigable type.

## **Central Nervous System Factors Relating to Strength and Power**

Motor nerves, which control physical movement, stimulate muscle fibers. Each motor nerve cell controls many muscle fibers. This nerve and fiber group is a motor unit. All motor units are comprised of the same fiber type (either entirely FT or ST fibers). Many

motor units make up a muscle. All muscle fibers in a motor unit will contract and relax at about the same time.

When performing Olympic lifting movements, a wide range of forces are required depending on the exercise. The athlete's ability to grade or vary the force application is an important factor in proper movement. Concerning these factors, we will limit the scope of our discussion to the following areas, which result in neuromuscular adaptation: intra-muscular and inter-muscular coordination.

### **Intra-muscular Coordination**

The amount of force produced during a muscle contraction can be varied or graded by (1) varying the number of motor units involved in the movement or (2) by changing the frequency at which the motor nerves fire. This is motor unit recruitment and frequency coding, respectively. These two factors are most important in the gradation of force.

The grading of force during most types of human movement follows Henneman's size principle. The smaller, slower motor units deal with low force demands, and as the force-required increases, the larger, faster motor units (FT) come into play. Studies by Hakinnen suggest during high-speed ballistic movements against medium to high resistance that the larger, faster fibers may come into play first.

Highly trained power athletes, such as weightlifters, are able to activate or recruit a high level of their available motor pool in a short period, thus generating great force. Untrained individuals may only be able to recruit up to 60 % of their fibers.

### **Inter-muscular Coordination**

Most athletic movements, including weightlifting, require complex coordination and efficiency of numerous muscle groups. There must be coordination between the muscles responsible for movement through contraction, the agonists or prime movers, and the muscles responsible for opposing movement, the antagonists. As we consider complex movement, it becomes obvious that we must have precisely timed contraction and relaxation of opposing muscle groups to provide smooth, fluid movement. This becomes even more important during powerful, high speed movement.

### **Adaptation to Strength and Power Training**

In all types of training, the objective is to create positive adaptations in the body that will allow for increased performance. These adaptations are the result of a specific stress

placed upon the body through training. The type of adaptation necessary to result in improved performance should dictate the type of training.

Based on the above discussion, determination of performance potential in strength and power has several adaptations. These include:

- Increased fiber diameter (hypertrophy)
- Improved intra-muscular coordination (recruitment and frequency coding)
- Improved inter-muscular coordination (synchronization)

Other factors beyond the scope of this manual that influence performance include energy system adaptation, circulatory adaptation, hormonal adaptation and psychological variables.

Training adaptation will depend upon several factors such as the current trained state of the athlete, the type of training employed and the movement pattern similarity of the training exercise to the actual event or task performed.

The power output produced during explosive lifts such as the clean, snatch and jerk are up to 10 times greater than the power output of traditional high force/ low velocity movements such as the bench, back squat and dead lift. Research has shown that high power-type training will produce adaptations in rate of force development, peak power and speed. Studies by Stone have shown that when power training with traditional high force/low velocity exercise, the results are more positive than when utilizing only one of the training methods.

## **Training Program Construction for Weightlifting**

Once a beginner has mastered the fundamental skills of the Olympic lifts and major assistance exercises, the coach will introduce the lifter to a planned training program. A sound, comprehensive training program may involve numerous aspects including periodization, biomechanical, physiological, psychological and nutritional aspects of sport. When working with athletes, USA Weightlifting suggests some kind of training program. A popular, common industry term sums this up the best; failing to plan means planning to fail.

A Monday and Wednesday Program could look as follows:

### **Monday:**

1. Warm-up

2. Low level plyometrics (3-5 sets)

3. Snatch

4. Front Squat

5. Power Clean

6. Snatch Pull

7. RDL

8. Stretching

**Wednesday:**

1. Warm-up

2. Low level plyometrics (3-5 sets)

3. Clean and Jerk

4. Overhead Squat

5. Power Snatch

6. Clean Pull

7. Low Back and Abdominal workouts

8. Stretching

The training session should not be too long. One to one and one half hours is the maximum time advised for beginners. Three training sessions per week with a day of rest between each is best for beginners. However, on non-training days youngsters especially, should be encouraged to participate in recreational exercises, such as ball games, swimming etc.

**Loading and Intensity for Beginners**

It is very difficult initially to gauge the weight to use, especially on the high skill exercises and lifts. The coach should start the athlete with a light weight, maybe the empty bar, and increase the load progressively, set to set, until the technique begins to break down. Once this occurs, stop. With the strength and power building exercises,

normally the skill level is much lower and failure to complete. The required repetitions can be the guide.

Guidelines:

- High skill/total body movement exercises no more than three repetitions per set
- Lower skill/strength building exercises no more than five repetitions per set

Progression:

- High skill exercises/lifts- increase resistance for each set until the skill starts to breakdown
- Lower skill/strength lifts- increase resistance for each set until the fifth repetition is very difficult to complete

### **Weekly Training Program**

As an example of a beginner's weekly program, we may use the Monday and Wednesday session plans listed earlier and include this plan for Friday:

Friday

1. Warm-up
2. Low level plyometrics (3-5 sets)
3. Snatch
4. Clean & jerk
5. Back squat
6. Abdominal/low back exercises
7. Dynamic medicine ball throws
8. Stretching and mobility

Once beginners have completed between one and one half to two months of this type of weekly training program described with progression in resistance being dictated by the coach, then a testing week may be incorporated. Under close supervision and the use of spotters if necessary, the athlete may attempt a maximum single repetition on the lifts and lift related exercises (i.e., squats, jerk from rack, etc.), but not on pulls. Percentages for pulls may be used once a 1RM is established. The results of these tests will now form the baseline for more advanced programming.

## Long and Short Term Training Plans

Once the beginner program is outlined, completed and the testing results compiled, more ambitious and result-producing plans can be made. Most sports, including weight training tend to plan short term, on a three, four or five week training approach but now most other sports have adopted this technique and the term "periodization" is sometimes used to describe it. Basically, training volume and intensity, varying the weights, repetitions and sets, is varied in a cyclical progression with highly stressful and lower stressful training sessions, to produce relevant overload and avoid over training. This type of training has been found to be the most result producing and progressive.

If a short-term plan, such as a four-week cycle, is incorporated in a 12-week long plan, it will be easier to understand this principle. For beginning athletes, an alternation of light and heavy loading weeks will produce cyclical progression. Having tested the athletes and having established a new 100% maximum, a percentage cycle to produce the plan is:

Week	1	2	3	4
Intensity	65%	75%	70%	80% (Weight of max set)

This is a cyclical variation of intensity and if the three-day per week session plan is used from earlier, the volume can be calculated. If each of the exercises and lifts is five sets of five repetitions (total 25 repetitions/ exercise) the total repetitions and therefore volume of work is 300 repetitions per week and 1200 repetitions per month. However, if volume per week is also manipulated the training effect will increase.

Week	1	2	3	4
Volume	240	300	240	300 (Total reps/week)

To produce this, just decrease the number of sets per exercise in the low volume weeks from five to four. The weight progression by set in doing the lift or exercises is also an important consideration between the heavier and lighter weeks. The following will illustrate the system in two of the four weeks.

### Week 1

Set	1	2	3	4
Percent	60%	65%	70%	65%
Reps	5	5	5	5
Avg. Intensity	65%			
Volume	20 reps			

### Week 2

Set	1	2	3	4	5
Percent	70%	75%	80%	75%	75%
Reps	5	5	5	5	5
Avg. Intensity	75%				
Volume	25 reps				

How then, can this cyclical principle be incorporated into a long-term plan, which, ultimately is designed to produce a new maximum snatch and clean & jerk in competition? Five sets of five repetitions are used as a basis per exercises in the first week cycle. In the second cycle, five sets of three repetitions are used. In the third cycle, five sets of two are used. However, in each 4-week cycle the intensity is gradually increased and the volume is gradually decreased so the long--term plan will look something like this:

Week	1	2	3	4		5	6	7	8		9	10	11
12													
%	65%	75%	70%	80%		70%	80%	75%	90%		90%	90%	85%
100%													
Vol.	240	300	240	300		144	180	144	180		96	120	96
120													

5 reps/set

3 reps/set

2 reps/set

During week twelve, at the coach's discretion, athletes may try a 1 RM if two repetitions have been performed with 100% the previous week. This 1 RM should not be overplayed however, and no more than one or two attempts per workout should be attempted. A competition should be held at the end of week thirteen, following a light training week of 80%. New maximums can now be established and another program can be planned using these new benchmarks.

This illustrates, very simply, the basis of program planning and as lifters become more advanced, the program can become more and more complex. Increasing the number of training days/per week and later the number of training sessions per day can increase volume. Cutting one of the light weeks out can increase the monthly loading.